

What is claimed is:

1. A conveyance apparatus, comprising:

a supporting device having a through hole passing in a gravity direction, to support a glass material in a fluid or semi-fluid condition,; and

a supplying device to supply a fluid into the through hole;

wherein when the glass material is dropped into the through hole from a top of the through hole, the glass material is supported by the fluid in the through hole, under a non-physical contact condition, and when the glass material is not supported by change of the amount of supply of the fluid, the glass material drops from a lower end of the through hole to an outside.

2. The conveyance apparatus of claim 1,

wherein the temperature of the glass material is controlled by the fluid supplied from the supplying device, when the fluid comes into contact with the glass material.

3. The conveyance apparatus of claim 1, further comprising:

a temperature control device for controlling the temperature of the fluid supplied to the through hole.

4. The conveyance apparatus of claim 3,

wherein the temperature control device has a heater and a thermal sensor which are arranged in a supplying path of the fluid.

5. The conveyance apparatus of claim 1,

wherein the fluid is supplied into the through hole in such a way that the fluid passes between the glass material and an interior wall of the through hole.

6. The conveyance apparatus of claim 1, further comprising:

a shutter member which is located lower in the vertical direction than a position through which the fluid is supplied into the through hole, and is movable between a position for closing at least a portion of the through hole, and a position for opening the through hole.

7. The conveyance apparatus of claim 1,

wherein the glass material is an optical glass.

8. The conveyance apparatus of claim 1,

wherein the temperature of the fluid supplied into the through hole is lower than the temperature of the glass material at the moment when the glass material is dropped into the through hole, and higher than the transition point of the glass.

9. The conveyance apparatus of claim 8,

wherein when the glass material is dropped into the through hole, the temperature of the fluid supplied into the hole is set higher than the softening point of the glass material, and after that, the temperature of the fluid is set lower than the softening point plus 100 °C, and is always higher than the transition point of the glass material.

10. The conveyance apparatus of claim 8,

wherein when the fluid is supplied into the through hole, the temperature of the fluid is set lower than the softening point of the glass material plus 100 °C, and is always higher than the transition point of the glass material.

11. The conveyance apparatus of claim 1,
wherein the glass material dropped from the conveyance apparatus is supplied to a molding die of a molding device.
12. The conveyance apparatus of claim 11,
wherein the glass material is molded by the molding die of the molding device, and becomes an optical element.
13. The conveyance apparatus of claim 1,
wherein the glass material to be dropped is less than 100 mm³.
14. The conveyance apparatus of claim 1,
wherein the transition point of the glass material is lower than 400°C.
15. The conveyance apparatus of claim 1,
wherein a tapered section which increases in diameter from its base to its top is provided on a top section of the through hole.
16. The conveyance apparatus of claim 1,

wherein a porous material is arranged on a portion of an inner circumferential surface of the through hole, and through which the fluid is supplied to the through hole.

17. The conveyance apparatus of claim 1,

wherein the porous material is a graphite.

18. A manufacturing apparatus of an optical element, comprising:

a supporting device having a through hole passing in a gravity direction, to support a glass material in a fluid or semi-fluid condition;

a supplying device to supply a fluid into the through hole; and

paired molding dies, one of which performs relative displacement with the other between an receptive position in which both of the dies are separated and an adjacent position at which the glass material is molded;

wherein when the glass material is dropped into the through hole from a top of the through hole, the glass material is supported under a non-physical contact condition by the fluid in the through hole, and when the glass material is not supported by change of the amount of supply of the

fluid, the glass material drops from a lower end of the through hole into one of the molding dies which is in the receptive position, and then the glass material is formed into an optical element.

19. The manufacturing apparatus of the optical element of claim 18,

wherein the temperature of the glass material is controlled by the fluid supplied from the supplying device, when the fluid comes into contact with the glass material.

20. The manufacturing apparatus of the optical element of claim 18, further comprising:

a temperature control device for controlling the temperature of the fluid supplied into the thorough hole.

21. The manufacturing apparatus of the optical element of claim 20,

wherein the temperature control device has a heater and a thermal sensor which are arranged in a supplying path of the fluid.

22. The manufacturing apparatus of the optical element of claim 18,

wherein the fluid is supplied into the through hole in such a way that the fluid passes between the glass material and an interior wall of the through hole.

23. The manufacturing apparatus of the optical element of claim 18, further comprising:

a shutter member which is located lower in the vertical direction than a position through which the fluid is supplied into the through hole, and is movable between a position for closing at least a portion of the through hole, and a position for opening the through hole.

24. The manufacturing apparatus of the optical element of claim 18,

wherein the glass material is an optical glass.

25. The manufacturing apparatus of the optical element of claim 18,

wherein the temperature of the fluid supplied into the through hole is lower than the temperature of the glass material at the moment when the glass material is dropped

into the through hole, and higher than the transition point of the glass.

26. The manufacturing apparatus of the optical element of claim 25,

wherein when the glass material is dropped into the through hole, the temperature of the fluid supplied into the hole is set higher than the softening point of the glass material, and after that, the temperature of the fluid is set lower than the softening point plus 100 °C, and is always higher than the transition point of the glass material.

27. The manufacturing apparatus of the optical element of claim 25,

wherein when the fluid is supplied into the through hole, the temperature of the fluid is set lower than the softening point of the glass material plus 100 °C, and is always higher than the transition point of the glass material.

28. The manufacturing apparatus of the optical element of claim 18,

wherein the glass material to be dropped is less than 1.00 mm³.

29. The manufacturing apparatus of the optical element of claim 18,

wherein the transition point of the glass material is lower than 400 °C.

30. The manufacturing apparatus of the optical element of claim 18,

wherein a tapered section which increases in diameter from its base to its top is provided on a top section of the through hole.

31. The manufacturing apparatus of the optical element of claim 18,

wherein a porous material is arranged on a portion of an inner circumferential surface of the through hole, and through which the fluid is supplied to the through hole.

32. The manufacturing apparatus of the optical element of claim 31,

wherein the porous material is a graphite.

33. A manufacturing method of an optical element, comprising:

a step of vertically dropping a glass material being heated and in a fluid or semi-fluid condition into a supporting a supporting device, having a through hole passing in a gravity direction;

a step of supplying a fluid into the through hole by a supplying means;

a step of supporting the dropped glass material against the force of gravity, under a non-physical contact except for the fluid which is supplied into the through hole;

a step of dropping the glass material into a molding die from a bottom of the through hole, by stopping the supply of the fluid, or reducing the amount of supply of the fluid; and

a step of forming the dropped glass material into an optical element by the molding dies.

34. The manufacturing method of the optical element of claim 33, further comprising:

a step of controlling the temperature of the fluid supplied by the supplying means,

wherein the temperature of the glass material is controlled by the fluid supplied from the supplying device, when the fluid comes into contact with the glass material.

35. The manufacturing method of the optical element of claim 34,

wherein the temperature of the glass material when the glass material is dropped into the through hole, is higher than the temperature of the glass material when the glass material is dropped into the molding die.